Claim Listing

1–24. (cancelled)

25. (new) A method for controlling position or force in an apparatus which has a roll nip between a first elongated rolling device and a second elongated rolling device in a paper or a board machine, the method comprising the steps of:

measuring a variable related to a position of the first elongated rolling device relative to the second elongated rolling device or the force exerted by the first elongated rolling device on the second elongated rolling device;

comparing the value of the measured variable to a preset value of said variable in order to obtain a difference value of the variable;

adjusting on the basis of the difference value of the variable, the position of the first elongated rolling device with respect to the second elongated rolling device or the force the first elongated rolling device exerts on the second elongated rolling device; and

changing a fluid pressure of a hydraulic device or changing a rate of flow of a fluid to the hydraulic device in order to alter the difference value of the variable, by stepwise opening or closing at least one digital valve in a digital valve pack functionally connected to the hydraulic device.

26. (new) The method of claim 25, wherein the difference value is obtained digitally and defines a digital difference value and wherein the step of changing a fluid pressure of a hydraulic device or changing a rate of flow of a fluid to the hydraulic device comprises the step of, on the basis of the digital difference value, opening selected digital valves of the digital valve pack whose flow volume achieves a decrease of the difference value.

27. (new) The method of claim 25, wherein the step of measuring a variable comprises measuring the position of the first elongated rolling device in the roll nip relative to the second elongated rolling device; and wherein the step of changing a fluid pressure of a hydraulic device or changing a rate of flow of a fluid to the hydraulic device comprises the step of opening selected valves of the digital valve pack, whose flow volume achieves a decrease of the difference value at a selected rate.

28. (new) The method of claim 25, wherein the step of measuring a variable comprises measuring an amplitude and frequency of vibration in the nip formed between the first elongated rolling device and the second elongated rolling device, and further comprising:

generating a control signal which is an inverse of the measured amplitude and frequency of vibration of the device;

wherein the step of adjusting on the basis of the difference value is an adjustment based on the control signal;

wherein the step of changing a fluid pressure of the hydraulic device or changing a rate of flow of a fluid to the hydraulic device comprises using the control signal to change the rate of flow of the fluid to the hydraulic device by opening and closing selected digital valves of the digital valve pack on the basis of the control signal in a phase opposite to the vibration.

29. (new) An arrangement for controlling position or force of an elongated rolling device in a roll nip between a first elongated rolling device and a second elongated rolling device, in a paper or board machine, the arrangement comprising:

a measuring device arranged to measure at least one variable related to position or force of the first elongated rolling device to produce a measurement signal;

a control system in measurement receiving relation to the measuring device, the control system arranged to compare the measurement signal with a selected set value of the variable to generate a control signal;

a hydraulic device arranged to change the position or force of the rolling device in the roll nip with a fluid pressure or a flow rate of the fluid; and

a switch connected in control signal receiving relation to the control system, the switch having at least one first digital valve pack having a plurality of digital valves, each of said plurality of digital valves being switchable stepwise between on and off on the basis of the control signal, so that the fluid pressure in the hydraulic device or the flow rate of the fluid to the hydraulic device can be changed by regulating the volume flow of fluid to the hydraulic device.

30. (new) The arrangement of claim 29, wherein the fluid flow to the hydraulic device is arranged through the digital valve pack, and wherein the plurality of digital valves are of different sizes, with the relationship of volume flows of the digital valves being such that the volume flow of a larger valve is double that of the valve with the next smaller volume flow.

31. (new) The arrangement of claim 30, wherein the measuring device is arranged to produce an analog measurement signal and wherein the control system includes an A/D converter having a digital output connected to the the digital valve pack.

32. (new) The arrangement of claim 31, wherein the digital output doses not pass through a D/A converter.

33. (new) The arrangement of claim 29, wherein the switch in addition to having at least one digital valve pack has an analog valve, arranged to supply the majority of the flow rate of the fluid to control the position of the first elongated rolling device or of the force the first elongated rolling device exerts on the second elongated rolling device in the roll nip.

34. (new) The arrangement of claim 29, wherein the switch further comprises a second digital valve pack, the hydraulic fluid pressure generated by the first digital valve pack and the second valve pack in the hydraulic device opening and closing the roll nip between the first elongated rolling device and the second elongated rolling device.

35. (new) The arrangement of claim 34, wherein the hydraulic device is a hydraulic cylinder having a piston head having a first side and a second side, and a first cylinder portion located on the first side of the piston head is connected to the first digital valve pack, and a second cylinder portion located on the second side of the piston head is connected to the second digital valve pack.

36. (new) The arrangement of claim 35, wherein the roll nip is arranged to be rapidly opened by opening all of the plurality of digital valves in the first digital valve pack.

37. The arrangement of claim 29, wherein the first elongated rolling device is a reel core, about which a fiber web is reeled, and wherein the second elongated rolling device is a reel cylinder, having a surface arranged to receive the fiber web and feed the fiber web into the roll nip which is located between the reel core and the reel cylinder;

wherein the hydraulic device is arranged to change the nip pressure in the roll nip by being functionally connected to the reel core, said hydraulic device additionally arranged to shift the position of the reel core relative to the reel cylinder; and

wherein the measuring device is arranged to measure the force exerted by the reel core on the reel cylinder in the roll nip or is arranged to measure the position of the reel core relative to the reel cylinder.

38. (new) The arrangement of claim 37, wherein:

the measuring device is arranged to detect amplitude and frequency of the reel core position which defines a vibration occurring in the reel core;

and wherein the control system is arranged to determine a counter-vibration and to generate a counter-vibration control signal; and

wherein the switch is connected in control signal receiving relation to the control system and is arranged to control vibration by regulating the volume flow of fluid to the hydraulic device.

39. (new) The arrangement of claim 29, wherein the first elongated rolling device and the second elongated rolling device are coating rolls, and are arranged to apply coating agent or coating paste onto one or both sides of a fiber web passing through the roll nip.

40. (new) The arrangement of claim 39, further comprising an application means, with the aid of which the coating agent or coating paste is applied to a surface of a first coating roll or of an endless belt rotating about the coating rolls.

41. (new) The arrangement of claim 29 wherein first elongated rolling device and the second elongated rolling device are rolls in a multi-nip calender and load reduction means are provided at least at the end of one said rolls;

wherein the hydraulic device is a hydraulic actuator provided at the end of one of said rolls;

and wherein the at least one digital valve pack is arranged for controlling the hydraulic actuator so that the hydraulic actuator compensates for loads caused by auxiliary equipment on the one of said rolls.

42. (new) The arrangement of claim 41, wherein an additional at least one digital valve pack is arranged to control hydraulic actuators within the one of said rolls for pressurizing different zones of a roll mantle of the one of said rolls.

43. (new) The arrangement of claim 41, wherein the hydraulic actuator provided at the end of the one of said rolls is arranged to open and close the roll nip.

44. (new) The arrangement of claim 29, wherein the first and the second elongated rolling device are rolls having loading devices therewithin, and wherein the operation of said loading devices is arranged to be controlled with the at least one digital valve pack.

45. (new) The arrangement of claim 29, wherein the first elongated rolling device is a doctor blade and wherein the hydraulic device is a hydraulic actuator arranged to control the nip pressure of the roll nip between the first and the second elongated rolling devices.

46. (new) A method for controlling position and force in an apparatus which has a roll nip between a first elongated rolling device and a second elongated rolling device in a paper or a board machine, the method comprising the steps of:

measuring a first variable related to position of the first elongated rolling device relative to the second elongated rolling device;

comparing the value of the measured variable to a preselected value of said variable in order to obtain a first difference value of the variable;

changing a rate of flow of a fluid to a hydraulic device arranged to position the first elongated rolling device relative to the second elongated rolling device, wherein the flow rate is adjusted by opening or closing every valve of a plurality of valves forming a digital valve pack, which will alter the first difference value of the variable toward the preselected value, and wherein each of the plurality of valves has a flow area different from every other valve of the plurality of valves; and

measuring a second variable related to the force exerted by the first elongated rolling device on the second elongated rolling device;

comparing the value of the measured second variable to a preselected value of said second variable in order to obtain a second difference value of the second variable;

changing the rate of flow of the fluid to the hydraulic device arranged to change the force of the first elongated rolling device relative to the second elongated rolling device, wherein the flow rate is adjusted by opening or closing every valve of the plurality of valves forming a digital valve pack, which will alter the second difference value of the variable toward the preselected value, and wherein each of the plurality of valves has a flow area different from every other valve of the plurality of valves.

47. (new) The method of claim 46:

wherein the first difference value and the second difference value are obtained digitally and define a digital first difference value and a digital second difference value; and

wherein the steps of changing the rate of flow of the fluid to the hydraulic device comprise the steps of, on the basis of the digital difference values, opening selected digital valves of the digital valve pack whose flow volume achieves a decrease of the difference values.

48. (new) The method of claim 46, wherein the steps of measuring a third variable comprise measuring an amplitude and frequency of vibration in the nip formed between the first elongated rolling device and the second elongated rolling device, and further comprising:

generating a control signal which is an inverse of the measured amplitude and frequency of vibration of the device;

wherein the step of adjusting on the basis of the difference value is an adjustment based on the control signal;

wherein the steps of changing the rate of flow of the fluid to the hydraulic device comprise using the control signal to change the rate of flow of the fluid to the hydraulic device by opening and closing selected digital valves of the digital valve pack on the basis of the control signal to damp out vibration.

49. (new) The arrangement of claim 46, wherein the roll nip is arranged to be rapidly opened by opening all of the a plurality of digital valves in the digital valve pack.

50. (new) The arrangement of claim 46 wherein the first elongated rolling device is a reel core, about which a fibre web is reeled, and wherein the second elongated rolling device is a reel cylinder, having a surface arranged to receive the fibre web and to feed the fiber web into the roll nip located between the reel core and the reel cylinder.

51. (new) The arrangement of claim 46, wherein the first elongated rolling device and the second elongated rolling device are coating rolls which are arranged to apply coating agent or coating paste onto one or both sides of a fiber web passing through the roll nip.

52. (new) The arrangement of claim 46 wherein first elongated rolling device and the second elongated rolling device are rolls in a multi-nip calender.